

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

cc
to

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Applicant (s) : Bart R. Jones et al.
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TC/A.U. : 3748
Examiner : Kyle M. Riddle
Title : ADHESIVELY BONDED VALVE COVER CYLINDER HEAD
ASSEMBLY
Docket No. : 434563A
Customer No. : 00109

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BRIEF FOR APPELLANT

REAL PARTY IN INTEREST

The Real Party in Interest in this Appeal is The Dow Chemical Company.

RELATED APPEALS AND INTERFERENCES

At this time there are no related appeals or interferences.

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STATUS OF CLAIMS

Claims 1-7, 11-14, 18-23 and 26-32 are pending. Claims 8-10, 15-17 and 24-25 have been cancelled.

STATUS OF AMENDMENTS

All amendments have been entered.

SUMMARY OF INVENTION

In one embodiment, the invention is a valve cover assembly comprising a valve cover having a mating surface having a continuous bead of an adhesive disposed on the perimeter of the mating surface wherein the adhesive has sufficient adhesive strength to hold the valve cover in place during normal operating conditions.

In another embodiment, the invention of such an engine assembly comprising one or more valve covers wherein each valve cover is adhesively bonded to a cylinder head by a continuous layer of adhesive disposed between the mating surfaces of each valve cover and the cylinder head wherein the continuous layer of adhesive forms a seal between the mating surface of each valve cover and cylinder head pair and the adhesive has sufficient adhesive strength to hold the valve cover in place during normal operating conditions.

In yet another embodiment, the invention is a method for bonding a valve cover to a cylinder head comprising;

- a) applying to the valve cover or the cylinder head, a continuous bead or film of adhesive along the entire mating surface of the valve cover or the cylinder head wherein the adhesive has sufficient cohesive strength to hold the valve cover in place during normal operating conditions;
- b) contacting the mating surface of the valve cover with the mating surface of the cylinder head such the continuous bead or film of

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adhesive is disposed between the mating surfaces of the valve cover
and the cylinder head;

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- c) curing the adhesive to form a permanent bond between the mating surfaces of the valve cover and the cylinder head wherein the adhesive forms a seal between the valve cover and the cylinder head.

The essence of the invention is the presence or use of a structural adhesive to bond a valve cover to a cylinder head. This feature is included in the claims specifically, 1, 11 and 18, which contain the phrase "wherein the adhesive has sufficient adhesive strength to hold the valve cover in place". Another key feature of the claims is the requirement that the valve cover does not have bolt holes which have a primary function of holding of the valve cover to the cylinder head. This requirement is found in Claims 2 and 32. Another key feature is found in Claims 26, 28 and 30, which require that the adhesive demonstrates a cohesive strength of 250 psi or greater when measured in lap shear mode according to ASTM D-3165-91. The further distinguishing feature is found in Claims 22 and 23, which require the presence of integral fastening means present to hold the valve cover in place until the adhesive cures.

References Relied Upon by the Examiner

Mochizuki et al., U.S. 4,985,523

Santella, U.S. 5,375,569.

References Relied Upon by Appellants

Frohwerk, U.S. 5,957,100

Japanese Patent 61,218,754

ISSUES

Do the teachings of Mochizuki et al., U.S. 4,985,523 (hereinafter Mochizuki) present a case of *prima facie* obviousness with respect to Claims 1-3, 11, 18-21 and 26-32?

Do the teachings of Mochizuki as modified by Santella, U.S. Patent 5,375,569 (hereinafter Santella) present a case of *prima facie* obviousness to Claims 4-7, 12-14, and 22-23?

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GROUPING OF CLAIMS

The claims do not stand or fall together. The claims are grouped into the following groups: Group I, Claims 1, 11 and 18; Group II, Claims 2 and 32; Group III, Claims 26, 28 and 30 and Group IV, Claims 22 and 23.

ARGUMENT-Summary of Argument

The references either singly or in combination fail to teach or suggest the use of a structural adhesive to bond a valve cover to a cylinder head; the use of an adhesive wherein the adhesive has sufficient adhesive strength to hold the valve cover in place (Claims 1, 11 and 18); that the valve cover does not have bolt holes which have a primary function of holding of the valve cover to the cylinder head (Claims 2 and 32); the adhesive used demonstrates a cohesive strength of 250 psi or greater when measured in lap shear modes according to ASTM D-3165-91 (Claims 26, 28 and 30); and (Claims 22 and 23), the presence of integral fastening means present to hold the valve cover in place until the adhesive cures.

The Final Rejection fails to provide sufficient motivation to modify the teachings of Mochizuki and/or Santella to include these recited features in a valve cover assembly, an engine assembly or method for bonding a valve cover to an engine head.

In order for case of *prima facie* obviousness to be present, a Final Rejection must provide an explanation of the elements of the claim which are specifically taught in the primary reference and motivation from secondary references to modify the primary reference to achieve the undisclosed elements, and therefore all of the elements of the claimed invention. If the Final Rejection does not or cannot provide motivation to make the modifications of the primary reference to get to all of the elements of the claimed invention, the Appellants have a right to a patent. The preamble of 35 USC §102 reads: "A person shall be entitled to a patent unless . . .". The remainder of 102 lists those criteria upon which the claims of the patent may be rejected. The import of the section is that unless the Final Rejection clearly describes one of the listed criteria, which

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describes the invention except for certain features and provides motivation for modifying the invention to include those features, Appellants have a right to a patent. In view of the fact that the Final Rejection has not made out a

case of *prima facie* obviousness, Appellants are entitled to allowance of the claims in this application.

Turning now to the teachings of the references, it should be noted that all of the cited references which disclose how a valve cover is attached to a cylinder head disclose the use of bolts to hold the valve cover in place. Furthermore, all of the references disclose the use of an adhesive to enhance the seal between a valve cover and a cylinder head. None of the references teach or suggest modification of any of the references to achieve the features cited hereinbefore as novel elements. More particularly, the references teach the adhesive to seal but not to hold the valve cover in place.

Mochizuki discloses anaerobically curing adhesive compositions; see col. 1, lines 64 to col. 2, line 49. The adhesive is designed to seal joints in automobile engines; see col. 1, lines 16-20. Note this passage indicates that the adhesive can be used to seal head covers to engine heads. The reference does not disclose the features recited hereinbefore. The real question is this a motivation to modify Mochizuki to get Appellants' claimed invention. In order for such motivation to be present, there must be secondary evidence that clearly suggest to the skilled artisan the necessary modifications to get these omitted elements. Appellants assert that the Office Action does not provide sufficient motivation to modify the teachings of Mochizuki to get to Appellants' claimed invention. Examination of the cited references in the Final Rejection discloses a use of an adhesive to seal joints. See Mochizuki, col. 1, lines 16-20; col. 7, lines 9-49; col. 12, lines 64-65 and col. 13, lines 19-22. Mochizuki does not provide any disclosure of how to hold a valve cover in place on an engine head. Santella discloses valve covers affixed and held to engine heads by the use of bolts and bolt holes. See Figures 1 and 2, in particular, reference no. 18. Note, that Figure 2(a) is a cut-away of the same valve cover as in Figure 2, but that the cut-away portion does not cut through a bolt hole so that bolt

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holes are not illustrated in that view. Furthermore, in Santella, the reference to bonding refers to bonding two parts of the valve cover together. See col. 4, lines 14-18. Note that the bonding disclosed as a result of contacting a molten thermoplastic to molten thermoplastic parts and no adhesive is disclosed for such bonding. An English translation of Japanese Patent 61,218,754 of which an abstract was previously provided is enclosed herewith. This reference shows a head cover secured to an engine head using nuts and bolts, see page 2, lines 10-11 and page 3, lines 20-22. It is further disclosed that the sealing power is

provided by bolts, see page 2, lines 21-23 and page 4, line 34. The reference further discloses that the adhesive is used to seal between the valve cover and the engine head, in particular, see page 4, lines 8-12, 21-22 and 25-28. Furthermore, Frohwerk et al., U.S. Patent 5,957,100 (hereinafter Frohwerk), discloses the use of bolts to connect a cylinder head cover to cylinder housing. See col. 2, lines 53-57 and col. 3, lines 31-35. Frohwerk also discloses the use of adhesives that enhance of their gasket, see col. 3, lines 20-27.

The Final Rejection on page 2 in part 2 states: "Mochizuki et al. disclose an adhesive sealant with tensile strengths up to 40 kgf/cm²" and then concludes it would be obvious to use the adhesive to bond and hold a valve cover in place. The conclusion does not logically follow from the teachings contained in Mochizuki, for the following reasons. First, there is no teaching or suggestion in any reference which suggest the use of an adhesive to hold a valve cover in place under normal operating conditions. All of the references clearly teach or suggest that bolts are used to hold the valve cover in place. Further, Mochizuki provides no teaching whatsoever of how a valve cover is held in place. Mochizuki discloses an adhesive composition which has as its primary function a sealing function to seal between a valve cover and cylinder head. See col. 1, lines 16-20; col. 4, lines 54-57 and col. 7, lines 20-23. Secondly, the tensile properties measure the internal strength of a polymeric material. It does not measure the adhesive strength of that material. Typically to determine adhesive strength, lap shear and peel tests are used. There is no reference in Mochizuki or any of the other references which suggest suitable lap shear strength for an adhesive used to bond and hold a valve cover in place. In fact,

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Mochizuki demonstrates that the adhesives disclosed would not be suitable for holding a valve cover in place under normal operating conditions. The description of Test 1 starting at col. 10, line 40 and going to col. 11, line 6 shows testing on a variety of samples of the invention for elongation, tensile strength and peel strength. The best sample, Sample 1, shows a peel strength of 2.5 kilograms force which translates to 34 psi. The lowest tensile strength demonstrates is 0.3 kilograms force which converts to 4 psi. It should be noted at col. 11, lines 2-6, it is indicated that Sample 1, which has the highest peel strength, has too much adhesive strength to be used in the invention claimed therein. It is also disclosed that much lower peel strengths are desirable. Thus, the data demonstrates a relatively low adhesive strength, which is enough to

improve the seal but certainly not enough to hold a valve cover in place without the use of bolts. Further, this data indicates that there is no correlation between the tensile strength and the peel strength, and thus there would be poor correlation between the tensile and adhesive strength. Furthermore, Mochizuki discloses that low adhesive strength is desirable so that the sealing material can easily be removed from the cylinder head or valve cover. See col. 4, lines 5-6 and col. 4, lines 54-63. This passage alone motivates one skilled in the art away from modifying the adhesive and then utilizing the adhesive to bond the valve cover to the cylinder without the need for bolts. The reference does disclose how to make higher strength adhesives, but it provides no motivation to do so.

The Final Rejection on page 2 in part 2 states: "Mochizuki et al. fail to recite the functional language added to Claims 1, 11 and 28, specifically, ' wherein the adhesive has sufficient cohesive strength to hold the valve cover in place during normal operations. However, Mochizuki discloses the adhesive has a holding strength of 568 psi and additionally suggests the use thereof on a valve cover. One having ordinary skill in the art would have reasonably assumed that the suggested adhesive would hold during normal operating conditions. Such a holding strength would encompass the above-functional recitation. Moreover, such adhesive qualities would negate the need for bolts (re Claims 2 and 32) as a securing means to one of ordinary skill in the art." This

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statement has several errors and errors in logic. First, Mochizuki discloses an adhesive which has a tensile strength of 568 psi and not a holding strength of 568 psi. See the discussion of the difference between tensile strength, peel strength and lap shear strength. Furthermore, see Table 1, as discussed hereinbefore which demonstrates that there is a significant difference between tensile and adhesive strength. Secondly, the conclusion that one having ordinary skill in the art would have reasonably assumed that such holding strength would encompass the above-functional recitation is a conclusion without providing any motivation to draw the conclusion and make the modification. Such a conclusion without evidence of motivation is an improper basis upon which to base a case of *prima facie* obviousness. This assumes that one could have imagined using an adhesive instead of bolts to hold the valve cover in place. This is the essence of Appellants' argument that until Appellants' invention, no one had imagined doing that, and therefore it is novel and unobvious. The statement that moreover such adhesive qualities would negate the need for bolts (Claims 2 and 32) as a securing means to one of ordinary skill in the art

is also conclusory. Absent a suggestion in a reference that an adhesive be utilized to perform the function, no case of *prima facie* obviousness is made out. The fact that at the time of the invention, adhesives existed which had appropriate adhesive strength to function in this manner is irrelevant as no one had imagined using an adhesive in such a manner, and it is incumbent for the Final Rejection to provide some motivation in the art which clearly suggests to one skilled in the art that such an adhesive be used to bond and hold a valve cover on an engine cylinder head. Furthermore, the standard at the time the invention was made was to use bolts to hold valve covers on cylinder heads.

Relative to Claims 27, 29 and 31, which provide a Markush list of preferred adhesives, the Final Rejection argues that it would be obvious to use such recited compositions to hold a valve cover in place because such adhesives are disclosed as useful as disclosed in Mochizuki. Mochizuki discloses such adhesives are useful in sealing between a valve cover and a cylinder head. As Mochizuki does not disclose the use of a structural adhesive to bond and hold the valve cover in place, the teaching of

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Mochizuki which discloses adhesives which are suitable for sealing is irrelevant to the issue of suitable adhesive families to bond and hold an engine valve cover in place.

Similarly, the argument that cure-on-demand techniques and preferred heating techniques are disclosed in Mochizuki, and therefore useful in bonding a valve cover to an engine cylinder head is inappropriate in that Mochizuki does not teach one skilled in the art that adhesives can be used for such function and as such cannot suggest to one skilled in the art which adhesive processes could be used for such. This is relevant to Claims 3 and 19-21. Relative to page 4, paragraph 5 of the Final Rejection, the following comments are relevant. The Final Rejection states: "Mochizuki et al. disclose engine heads and engine head covers adhesively bonded using multiple techniques such as catalysts, irradiation and anaerobically curing and heat curing". This statement is an incorrect statement of the teachings of Mochizuki. Mochizuki teaches using an adhesive composition to enhance the seal between an engine head and an engine head cover. Mochizuki does teach that such compositions would bond to the engine cover and to the engine head to enhance sealing properties, but does not teach bonding these parts together an adhesive.

Furthermore, as mentioned hereinbefore, Santella and Japanese Patent 61,218,754, "teach" that bolts are used to hold such parts together. On page 5, in part 6, the Final Rejection states: "Santella teaches the use of connecting the valve cover to the head with or without fasteners". This is a mischaracterization of the teaching of Santella. Santella does not

teach a valve cover without bolts or that it can be connected to the head without fasteners. All of the illustrated valve covers in Santella have bolt holes.

Mochizuki refers to adhesion for the purpose of improving the seal not for holding the valve cover in place. Further, Mochizuki recognizes insufficient releasability of some adhesives, but it does not suggest how such unacceptable adhesives could be used or that they could be used in place of bolts to hold a valve cover in place.

In paragraph 8 of the Final Rejection, it is stated "Mochizuki et al. disclose adhesive compositions particularly suited for adhesion and sealing with excellent durability and suggested for use in valve covers with sufficient holding power up to 568 psi. Applicants argue that the features of Mochizuki do not disclose a (sic) engine, valve

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cover with sufficient adhesion to hold the cover in place during normal operating conditions without the need for bolts. Examiner disagrees for the reasons cited above. It would have been obvious to one having ordinary skill in the art that such engine covers would inherently have the adhesive strength to hold the cover in place during normal operating conditions."

First, Mochizuki discloses the use of a material with a tensile strength of up to 40 kgf/cm² (about 568 psi). Tensile strength is not "holding strength" or adhesive strength, see col. 7, lines 29-33. The only guidance as to "holding strength" is the peel data found in Table 1, col. 10, lines 50 et seq. The peel strength demonstrated were 2.5 kgf or less which is much less than required in Appellants' claims. Thus, to conclude the materials "inherently" have adequate adhesive strength is contrary to the teachings of the reference.

Relative to paragraph 9 of the Final Rejection, several factual errors are cited as a basis for the rejection. The Final Rejection states, "It seems obvious to the Examiner that the valve cover cited by Mochizuki covers various types, shapes and designs as long as the cover is secured with the disclosed adhesives." Appellants can find no passage in Mochizuki that states that the valve cover is "secured to" the cylinder head using an adhesive. Mochizuki discloses in several places that the disclosed composition is used to seal the joint between the valve cover and the cylinder head, see references above. Appellants have requested a citation from Mochizuki supporting the assertion of the Examiner. The Examiner cites col. 7, lines 20-21, "The composition of the present invention can be used in a wide range of

applications including the above-described application, such as adhesion of planes, joining of various parts, locking of screws, fixing of shaft couplings, and the like." The passage does not disclose securing valve covers to a cylinder head with an adhesive wherein the adhesive has sufficient strength to hold the valve cover in place during normal operation. Thus, the passage is insufficient to motivate a skilled artisan toward the claimed invention.

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The Final Rejection states, "Applicants further argue the 'primary' function of Mochizuki is for sealing, but ignores the disclosed adhesive qualities of several compositions." The discussion presented hereinbefore addresses this. First, Appellants assert that the entirety of a reference must be considered when examining the issue of motivation to modify a reference to establish a case of *prima facie* obviousness. Mochizuki discloses that the disclosed compositions have adhesive properties, but that lowering the adhesive properties is desirable, see col. 4, lines 5-6 and 54-63. That one skilled in the art could modify the disclosed compositions, here the adhesive nature, for a different use, here to hold the valve cover in place during normal operations is not relevant. What is relevant is whether or not a skilled artisan is motivated to make the modification and use it in the use. Further, the data in the reference does not demonstrate good adhesive properties of the disclosed compositions, and that such low adhesion is desired, see col. 10, line 47 to col. 11, line 6. When the entirety of the teaching of Mochizuki is considered, there is no motivation to make to the claimed invention.

The Final Rejection states in part 9 that Mochizuki does not discuss or require the use of bolts. Mochizuki describes and claims a sealant composition and discloses it can be used to seal engine covers or cylinder heads. Mochizuki provides no drawings or descriptions of how engine covers are attached to cylinder heads, thus the failure to disclose the use of bolts is not indicative of the state of the art. Santella, Frohwerk and Japanese Patent 61,218,754 all show that engine covers are affixed to and held in place using bolts. The Final Rejection provides no evidence to suggest any other means of achieving this.

The Final Rejection argues that the data on peel strength is not an accurate measure of adhesive quality. Peel strength in Mochizuki is the best evidence

of the adhesive strength; because if a material does not stick it cannot function as an adhesive. Peel strength measures adhesion of a substance to a surface.

CONCLUSION

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The Final Rejection makes no mention of the use of integral fasteners means as required in Claims 22 and 23; therefore, these claims are allowable for this reason.

For the reasons stated herein, Appellants assert that no case of *prima facie* obviousness is made out and solicit reversal of the Final Rejection and allowance of Claims 1-7, 11-14, 18-23 and 26-32.

Respectfully submitted,



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CLAIMS ON APPEAL-APPENDIX

1. A valve cover assembly comprising a valve cover having a mating surface adapted to be attached to a cylinder head of an internal combustion engine having a continuous bead of an adhesive disposed on the perimeter of the mating surface of the valve cover wherein the adhesive has sufficient adhesive strength to hold the valve cover in place during normal operating conditions.
2. A valve cover assembly according to Claim 26 wherein the valve cover does not have bolt holes which have a primary function of holding the valve cover to the cylinder head.
3. A valve cover assembly according to Claim 26 wherein the adhesive is a cure-on-demand adhesive.
4. A valve cover assembly according to Claim 26 wherein the valve cover is fabricated from a plastic material.
5. A valve cover assembly according to Claim 4 wherein the valve cover further comprises one or more integral means for holding the valve cover in place on a cylinder head while the adhesive cures.
6. A valve cover assembly according to Claim 4 wherein the valve cover comprises a blend of nylon 6,6, nylon 6 or a mixture thereof with syndiotactic polystyrene.
7. A valve cover according to Claim 4 wherein the valve cover further comprises one or more access ports adapted to allow access to the cylinder head without removal of the valve cover and one or more means for covering and sealing the one or more access ports.
11. An engine assembly comprising one or more valve covers having mating surfaces and one or more cylinder heads having mating surfaces adapted to fit to the mating surfaces of the valve covers wherein each valve cover is adhesively bonded to

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a cylinder head wherein a continuous layer of adhesive is disposed between the mating surfaces of each valve cover and the cylinder head to which each valve cover is bonded, wherein the continuous layer of adhesive forms a seal between the mating surface of each valve cover and cylinder head pair such that the transmission of gasses and liquids between each valve cover and cylinder head pair where the mating surfaces are in contact is significantly reduced or prevented and the adhesive has sufficient cohesive strength to hold the valve cover in place during normal operating conditions.

12. An engine assembly according to Claim 28 wherein the valve cover is fabricated from a plastic material.

13. An engine assembly according to Claim 12 wherein the valve cover further comprises one or more integral means for holding the valve cover in place on a cylinder head while the adhesive cures.

14. An engine assembly according to Claim 12 wherein the valve cover further comprises one or more access ports adapted to allow servicing the cylinder head without removal of the valve cover and one or more means for covering and sealing the one or more access ports.

18. A method for bonding a valve cover to a cylinder head comprising
 a) applying to the valve cover or the cylinder head, wherein the valve cover has a mating surface adapted to be mated with a mating surface of a cylinder head, a continuous bead or film of adhesive along the entire mating surface of the valve cover or the cylinder head wherein the adhesive has sufficient cohesive strength to hold the valve cover in place during normal operating conditions;

b) contacting the mating surface of the valve cover with the mating surface of the cylinder head such the continuous bead or film of adhesive is disposed between the mating surfaces of the valve cover and the cylinder head;

c) curing the adhesive to form a permanent bond between the mating surfaces of the valve cover and the cylinder head wherein the adhesive forms a seal between the valve cover and the cylinder head.

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19. A method according to Claim 30 wherein the adhesive is a cure-on-demand adhesive and the adhesive bead is contacted with the valve cover mating surface in a location remote from the location wherein the valve cover is contacted with the cylinder head.

20. A method according to Claim 19 wherein the adhesive is activated just prior to contacting the valve cover with the cylinder head.

21. A method according to Claim 20 wherein the adhesive is activated by exposure to a heat source just prior to contacting the valve cover with the cylinder head.

22. The method of Claim 21 wherein the valve cover mating surface and the cylinder head mating surface are maintained in contact, with the adhesive bead or film disposed between them, through the use of a mechanical fastening means other than bolts.

23. The method of Claim 22 wherein the mechanical fastening means is integrally attached to valve cover and/or the cylinder head.

26. The valve cover assembly according to Claim 1 wherein the adhesive demonstrates a cohesive strength of 250 psi or greater when measured in lap shear mode according to ASTM D3165-91 4.

27. The valve cover according to Claim 26 wherein the adhesive comprises a high temperature epoxy resin, a polyimide, a hybrid polyimide/epoxy resin adhesive, a silicone, a fluorosilicone, an alkyl borane initiated acrylic adhesive system or an epoxy novolac/nitrile rubber adhesive.

28. The engine cover assembly according to Claim 11 wherein the adhesive demonstrates a cohesive strength of 250 psi or greater when measured in lap shear mode according to ASTM D3165-91 .

29. The engine cover according to Claim 28 wherein the adhesive comprises a high temperature epoxy resin, a polyimide, a hybrid polyimide/epoxy resin

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adhesive, a silicone, a fluorosilicone, an alkyl borane initiated acrylic adhesive system or an epoxy novolac/nitrile rubber adhesive.

30. The process according to Claim 18 wherein the adhesive demonstrates a cohesive strength of 250 psi or greater when measured in lap shear mode according to ASTM D3165-91 .

31. The process according to Claim 30 wherein the adhesive comprises a high temperature epoxy resin, a polyimide, a hybrid polyimide/epoxy resin adhesive, a silicone, a fluorosilicone, an alkyl borane initiated acrylic adhesive system or an epoxy novolac/nitrile rubber adhesive.

32. The engine assembly of Claim 28 wherein the valve cover and engine head do not have bolts and bolt holes to hold the valve cover in place.